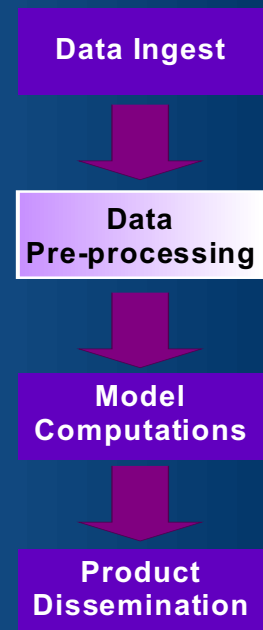


OFS Preprocessors

Data Preprocessing

OFS Preprocessors

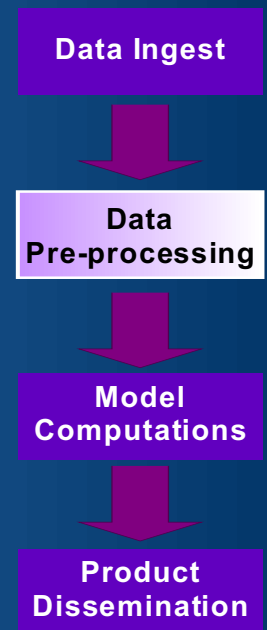
- OFS preprocessors convert raw data into **time series** form by:
 - ▶ **Filling** in missing data,
 - ▶ **Computing** areal averages, and
 - ▶ **Distributing** data into even time steps.
- The 3 step process:
 - ▶ First, estimate stations with missing data
 - ▶ Next, compute a spatial and time aggregate over a pre-defined area (e.g. 24 hour MAP)
 - ▶ Finally, distribute the aggregate into even time steps (e.g. 6 hour MAP)



OFS Preprocessors

Names of the Preprocessors

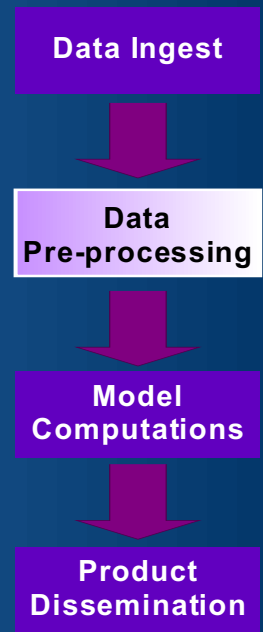
- The preprocessors are MAP, MAPX, FMAP, MAPE and RRS. They are **Functions** in the FCST program.
 - ▶ The preprocessors use parametric information entered into the OFS Data Base by PPINIT.



OFS Preprocessors

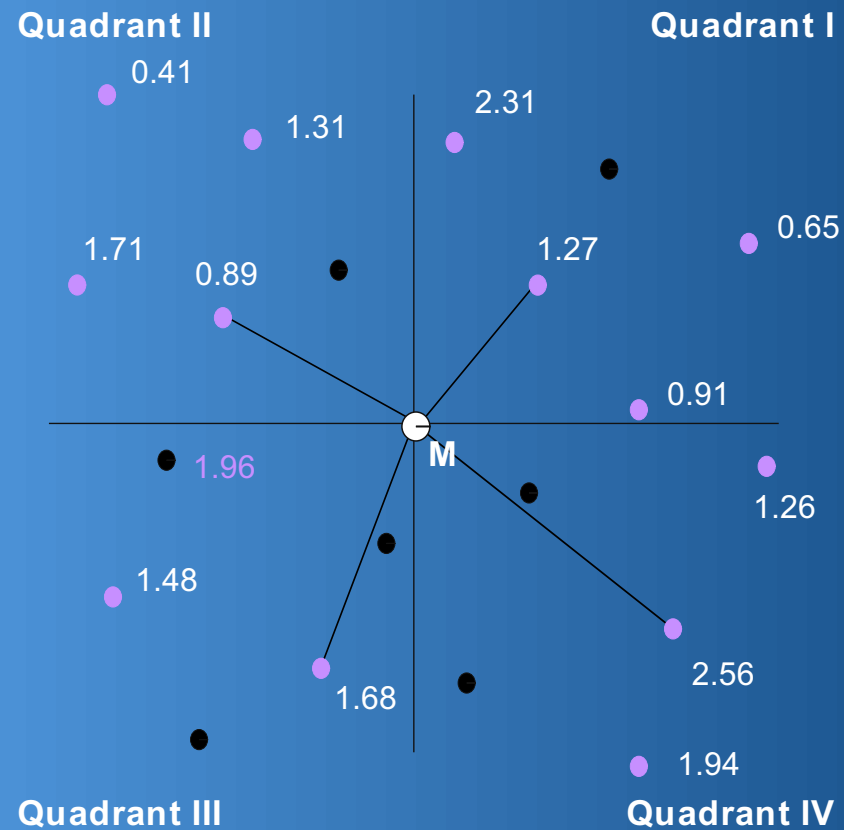
MAP – Computes Mean Areal Precipitation

- Missing data estimation:
 - ▶ Uses quadrants and inverse distance squared, or
 - ▶ Pre-defined weights
 - ▶ Monthly means (characteristics)
- Areal averaging:
 - ▶ Theissen weights, or
 - ▶ Inverse distance to the basin centroid, $1/D^x$, or
 - ▶ Pre-determined weights.
- Temporal Distribution:
 - ▶ Based on time distribution of surrounding stations.



OFS Preprocessors

MAP – Estimation of Missing Precipitation



Data Ingest

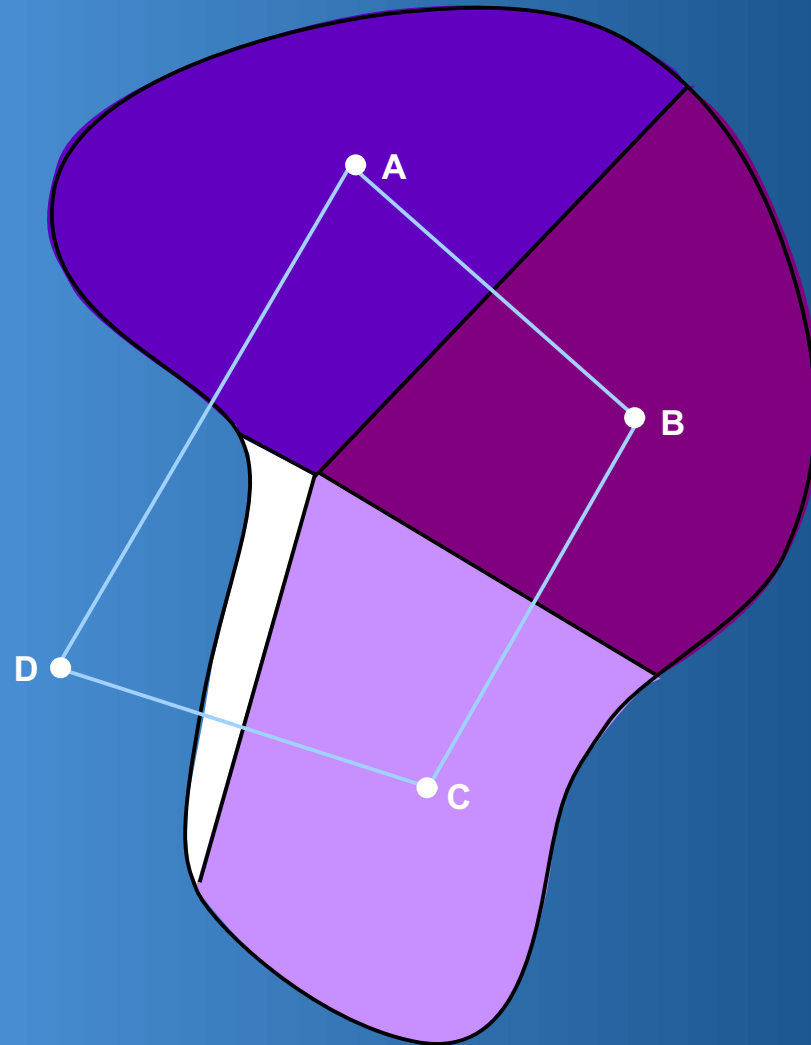
Data
Pre-processing

Model
Computations

Product
Dissemination

OFS Preprocessors

MAP – Construction of Thiessen Polygons



Data Ingest

Data
Pre-processing

Model
Computations

Product
Dissemination

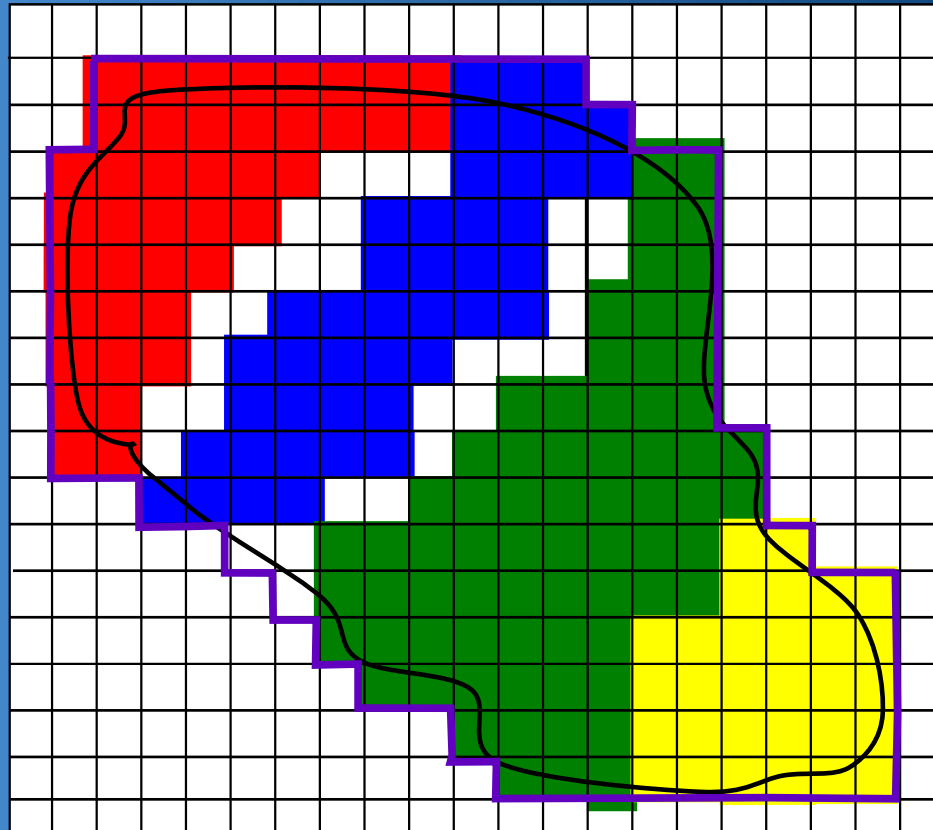
OFS Preprocessor

MAPX – Computes Mean Areal Precipitation from Gridded Data

- Missing data estimation:
 - None allowed
- Areal averaging

Red: 0.00" (20 bins)
White: 0.05" (20 bins)
Blue: 0.10" (30 bins)
Green: 0.20" (50 bins)
Yellow: 0.25" (15 bins)

$$\text{MAPX} = 17.75 / 135 = 0.13"$$



Data Ingest

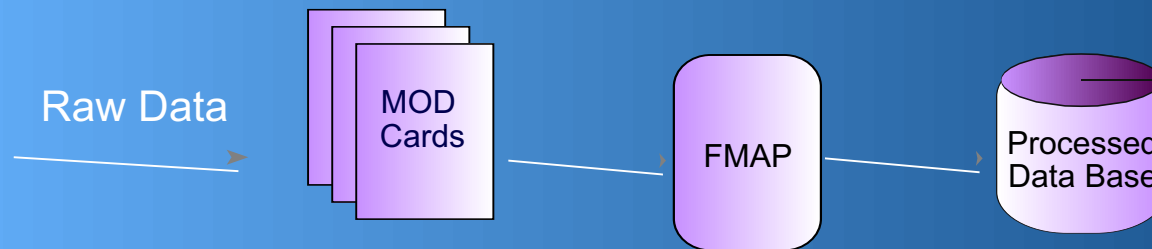
Data
Pre-processing

Model
Computations

Product
Dissemination

OFS Preprocessor

FMAP — Stores QPF



Data Ingest

Data
Pre-processing

Model
Computations

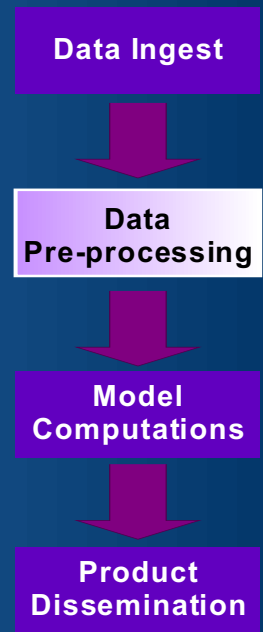
Product
Dissemination

- Data is entered via MOD cards.
- The order you run MAPX and FMAP makes a difference.
 - ▶ If you run FMAP after you run MAPX your future precipitation will not be integrated into your MAPX time series.
 - ▶ Run FMAP first.

OFS Preprocessor

MAT – Computes Mean Areal Temperatures

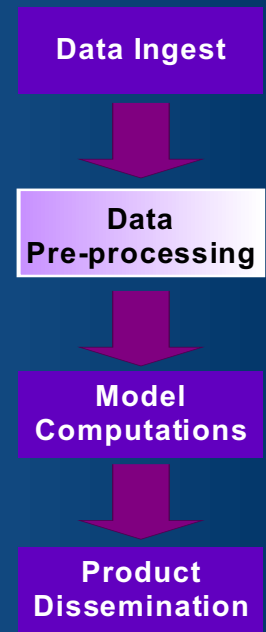
- Missing data estimation:
 - ▶ Uses quadrants and inverse distance squared, or
 - ▶ Pre-defined weights
 - ▶ Monthly means and elevation factors
- Areal averaging:
 - ▶ Inverse distance to the basin centroid, $1/D^x$, or
 - ▶ Pre-determined weights.
- Temporal Distribution:
 - ▶ Based on time distribution of surrounding stations.
- Synthetic Stations:
 - ▶ An alternate approach for estimating high elevation areas



OFS Preprocessor

MAPE – Computes Mean Areal Potential Evaporation

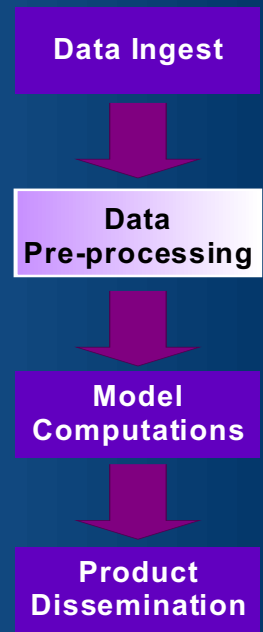
- Missing data estimation:
 - No missing data estimation – blends to areal mean
- Future data:
 - None – blends to montly areal mean



OFS Preprocessor

RRS - Writes River, Reservoir and Snow Data to PDB

- RRS data is valid at a point - no areal averaging.
- Missing data may or may not be allowed,
 - Estimation depends on data type.
- Time Distribution:
 - Creates a time series with a uniform time interval.



OFS Preprocessors

RRS - Missing Allowed

- **Instantaneous** – If the number of observations at $\pm \frac{1}{2}$ time step is:
 - ▶ = 0 then set to missing,
 - ▶ = 1 then set to the value of that observation,
 - ▶ > 1 (all on one side) then set to the value of the closest observation, or
 - ▶ >1 (on both sides) then use linear interpolation between the closest value on either side.
- **Mean** – If any of the hourly values in the work array are missing then set to missing.

OFS PreProcessors

RRS – Instantaneous, No missing allowed

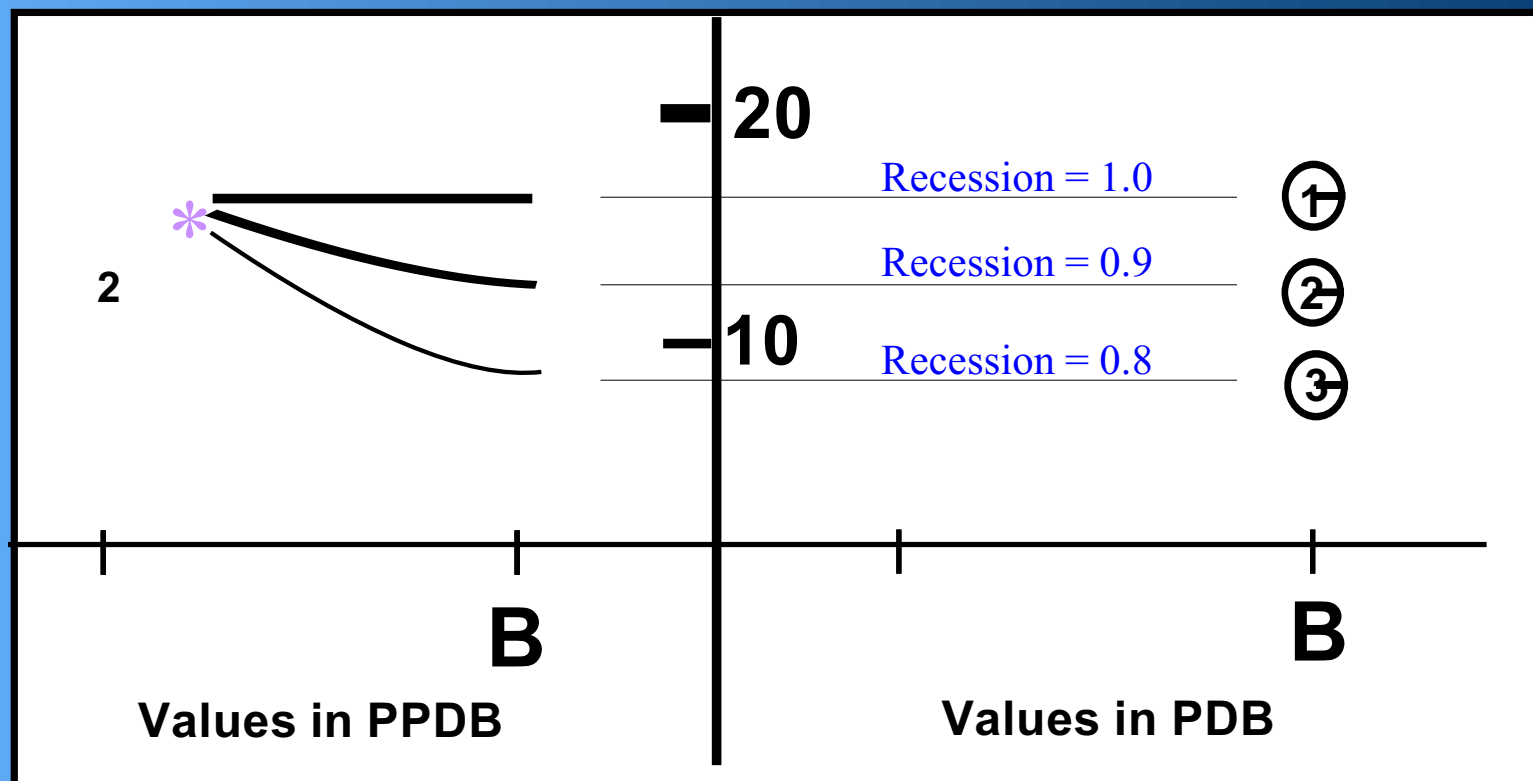
- Estimation procedure depends upon the data available.
 - Extrapolate
 - Interpolate
 - Recession

OFS Preprocessors

Instantaneous - No Missing Allowed

Predicting at time B, when:

1. Only an observation before B in PPDB

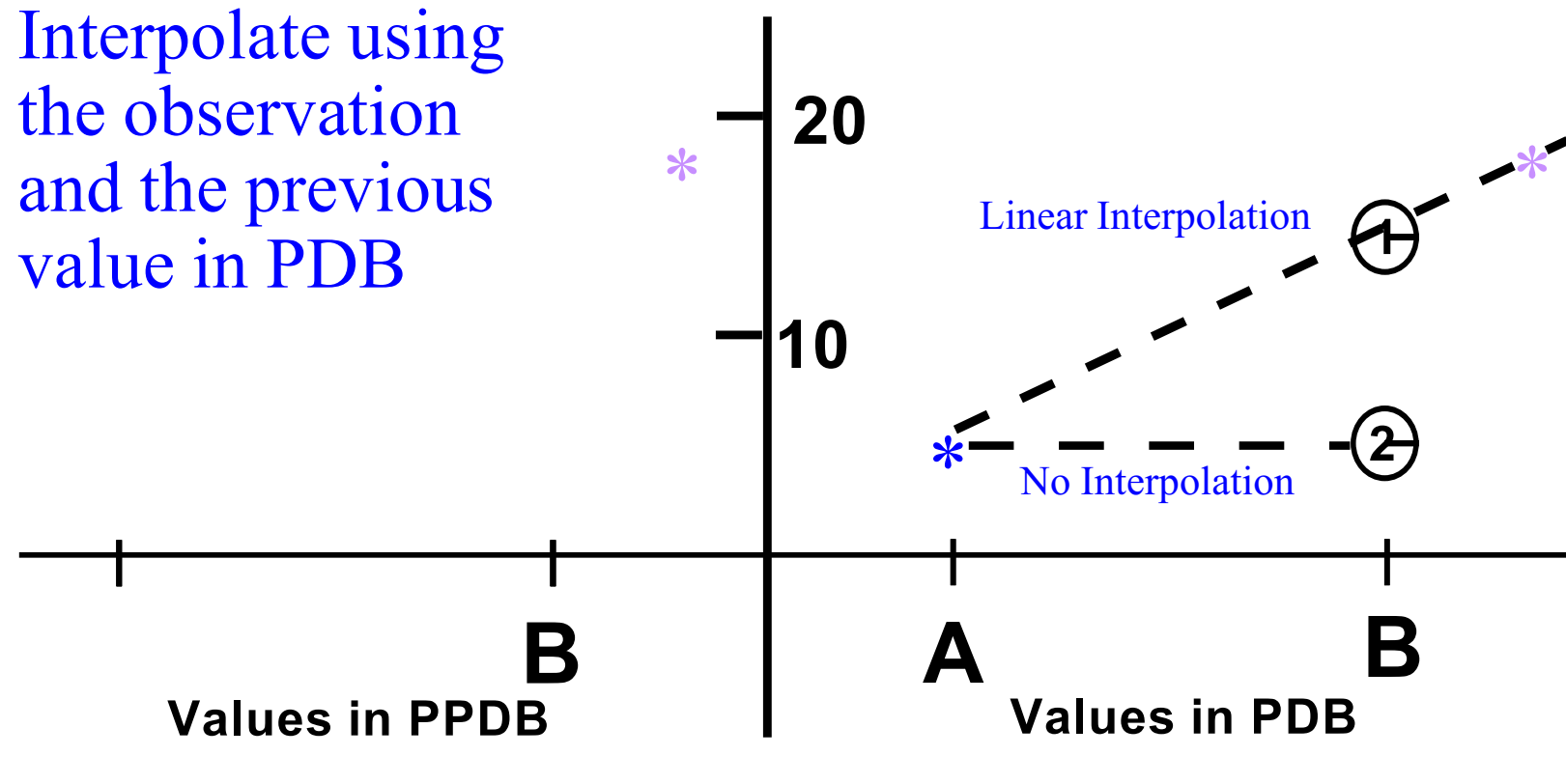


OFS Preprocessors

Instantaneous - No Missing Allowed

2. Only an observation after B in PPDB

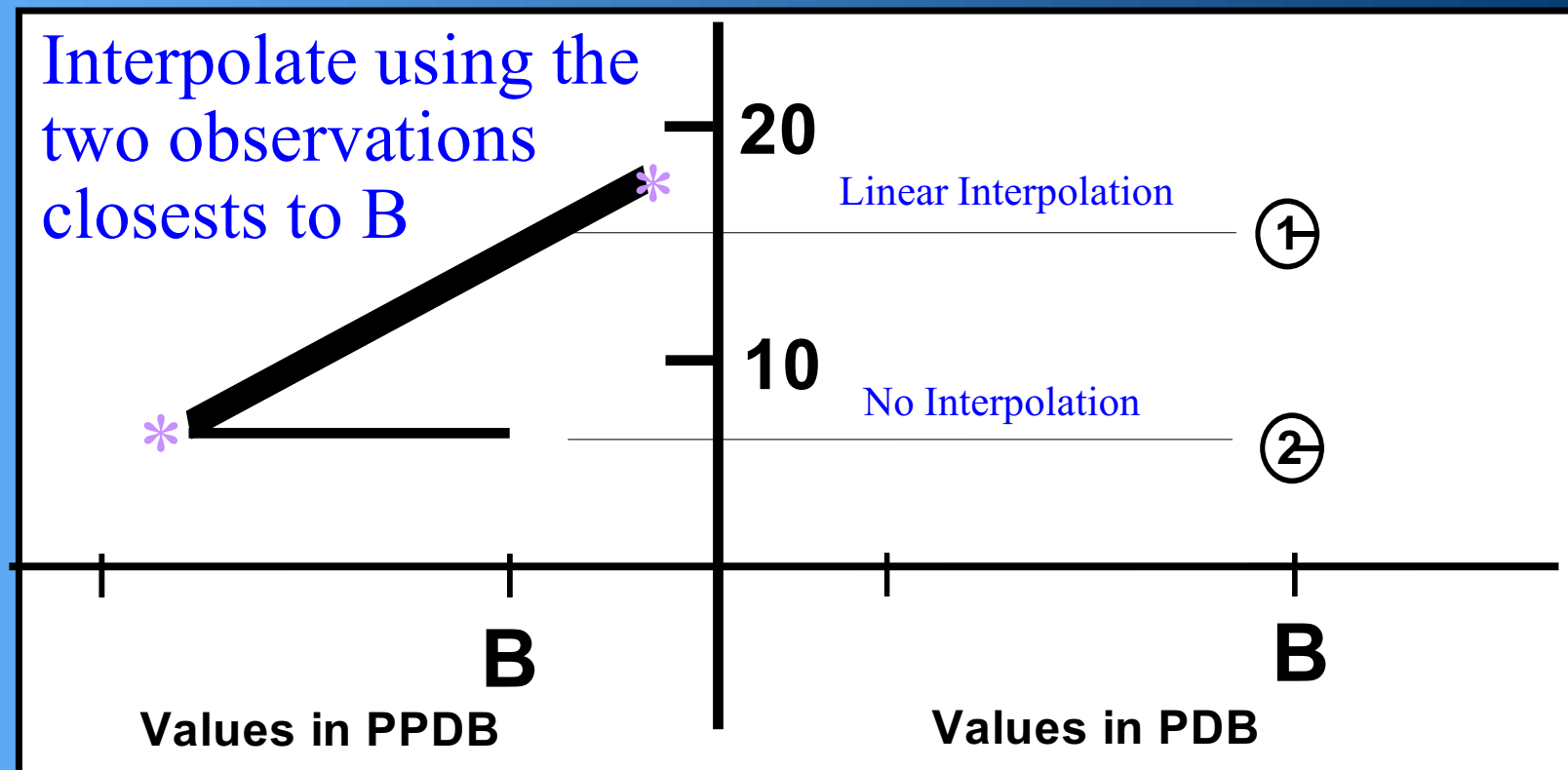
Interpolate using
the observation
and the previous
value in PDB



OFS Preprocessors

Instantaneous - No Missing Allowed

3. Observations before and after B in PPDB



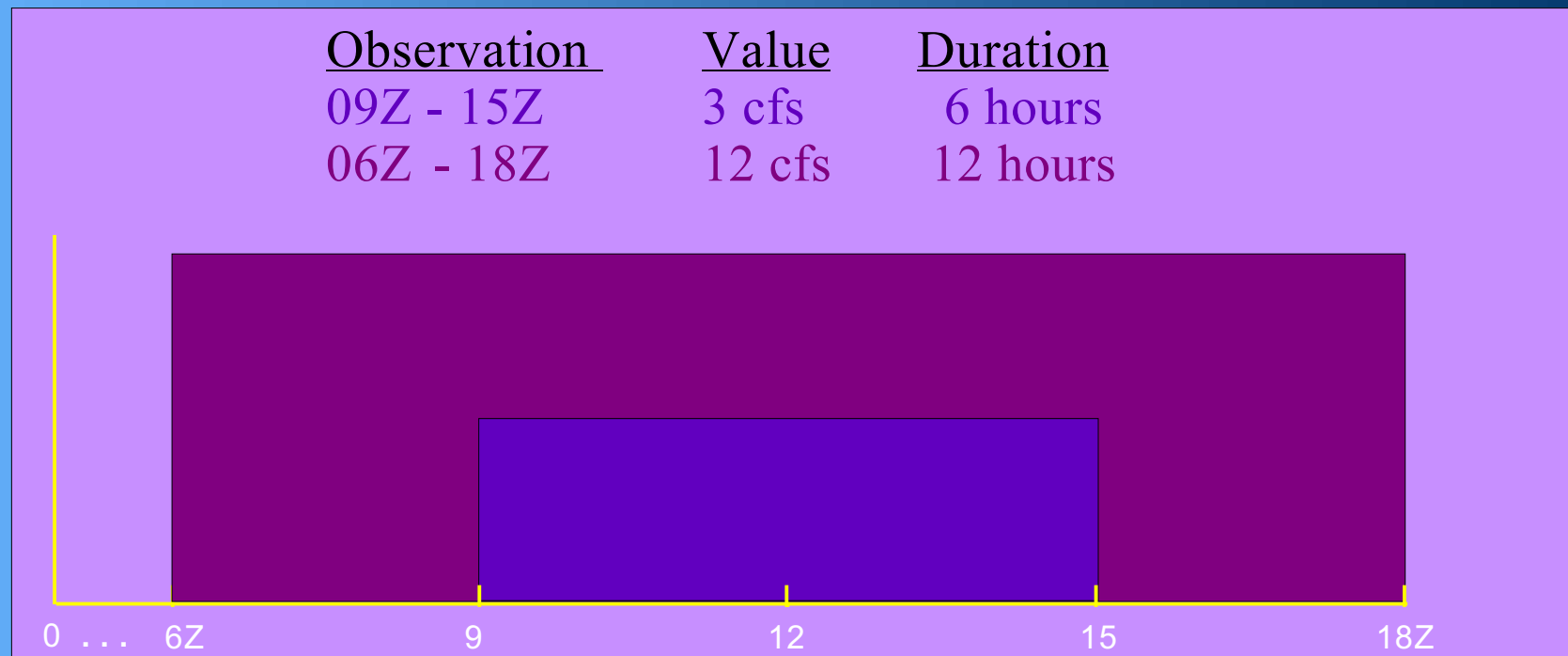
Mean – No Missing Allowed

- Creates an empty array with a 1 hour time step.
- Inserts hourly values into the array for the shorter durations first.
- Subtracts the value of the shorter duration from the longer duration; the remaining value is uniformly distributed for the non-overlapping extent of the longer duration.
- Combines the uniformly distributed time series and converts uniform 6 hour values to daily values.
- If any missing values remain in the array, interpolate/extrapolate using the same rules as for instantaneous data.

OFS Preprocessors

Mean – No Missing Allowed

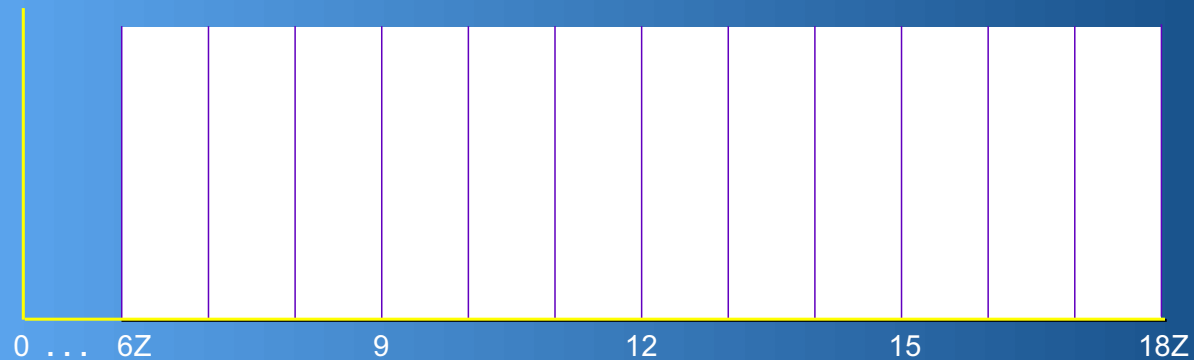
- Process any overlaps and uniformly distribute the data.
 - ▶ Overlaps are caused by 2 or more data values with overlapping observation periods.



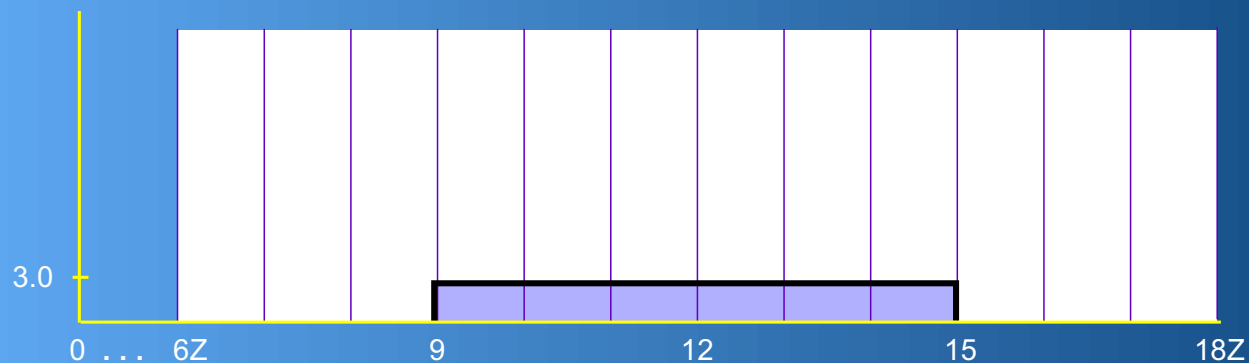
OFS Preprocessors

Mean – No Missing Allowed

Creates an empty array.



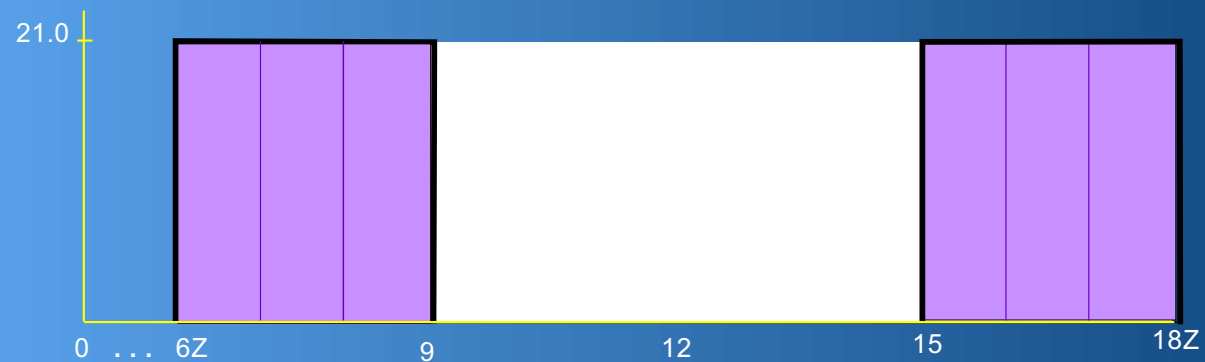
Inserts values for shorter durations
 $3 \text{ cfs} \times 6 \text{ hours} = 18 \text{ cfsh.}$



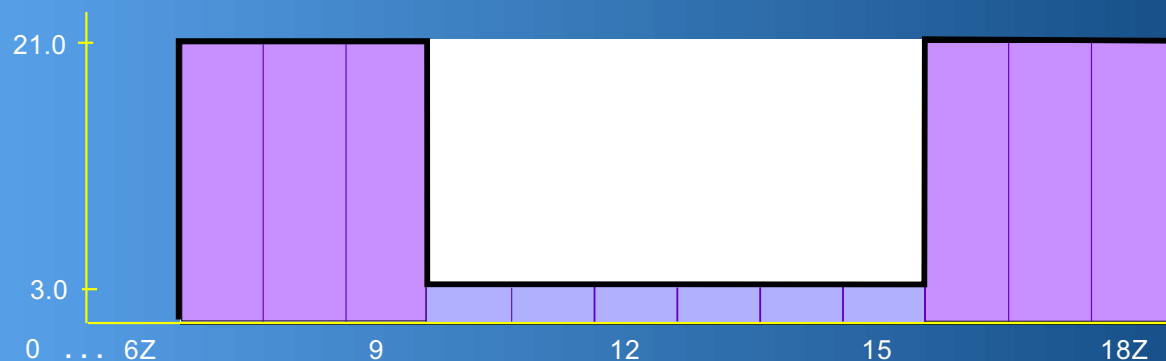
OFS Preprocessors

Mean - No Missing Allowed

Process the longer duration time series
 $144 \text{ cfsh} - 18 \text{ cfsh} = 126 \text{ cfsh}$ for 6 hours (21 cfs)



Combine



OFS Preprocessors

Mean – No Missing Allowed

Covert cfs to cfsd for each 6 hour period
from 6 - 12Z

$$\frac{21+21+21+3+3+3}{6} = \frac{72}{6} = 12 \text{ cfs for 6 hours} = 3 \text{ cfsd}$$

from 12 - 18Z (same)

